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CIRCULAR NO. 520 MARCH 1939
UNITED STATES DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

WILDLIFE OF THE ATLANTIC COAST SALT MARSHES

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INTRODUCTION

Many salt marshes of the Atlantic coast are now undergoing intensified ditching in furtherance of mosquito control. Possible effects of these operations on wildlife are a matter of great concern to naturalists, who urge that so far as possible the work be carried on in harmony with the highest conservation ideals.

Conservation means different things to different people. Some think of protecting only things that can be used, and here again there is more than one school of thought—or at least, of action: One protects only to the date of use and takes what it wishes without planning for replacement—this has been compared to mining; the other strives for replacement, so that there can be sustained use—this has been compared to crop production. There is also protection for beneficial economic tendencies, without direct use—this principle underlying the protection of insectivorous birds. Finally there is conservation for its own sake, the goal of the nature lover.

Whatever his particular interest in wildlife may be, the nature lover is one who, consciously or not, is impressed with the fellowship of all living things, a fellowship that is very real. He sees that in structure, in habits, and in impulses, his wild neighbors often seem much like himself. Either they are very human or he is very much like them; they are indeed blood relatives.

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It should never be forgotten that they share with man also the joy of living. No man can possibly get as much pleasure from water as does a porpoise or an otter. However perfect his equipment, man can never be attuned to flying like the terns, the swallows, and other birds whose pliant grace, in calm or storm, is marvelous. No man can be at home in a tree like a woodpecker, which, born, cradled, and housed in trees its whole life long, must feel each evening when it comes for rest to its snug retreat that this tree, this nest, is the best and safest place in all the world.

That wildlife enjoys living in general as much as man, and probably in many ways even more, is a thought that should never be entirely out of mind. Man assumes dominion over wildlife and exercises it as he can, but in so doing he should as far as possible in the case of every creature, respect its right to existence, to its chosen home, and to undisturbed enjoyment of its way of life. As has been so often, but not too often, said, in following out ideas for readjusting wildlife and its environment, man should do only what is necessary and no more.

THE SALT MARSHES

Salt marshes reach their best development where the coast has long been slowly sinking. Their extent indicates the degree to which low-lying shores and the estuaries of streams are being "drowned." It does not take a highly skilled engineer to make convincing observations as to the sinking of the Atlantic coast. Anyone seeing stumps of trees standing well out in salt water, sometimes 10 to 15 feet under low tide, knows that where they grew was once dry land and that either the sea has risen or the land subsided, the latter seeming by far the more likely supposition. Such groups of stumps standing in natural position, just as they would in a clearing, may be seen at numerous points along the Atlantic coast. Another evidence of sinking is the channels of streams that extend far seaward under water where they could not have been cut except when the bottom in that quarter was marsh. Engineers have measured the subsidence of the Atlantic coast and obtained results indicating a sinking of about a foot in a hundred years.

ZONES OF SALT-MARSH PLANTS

This sinking is a great aid to the formation of extensive salt marshes. As the ocean slowly creeps up on the land, salt water kills ordinary land plants. Their place is taken by others that can endure a slight quantity of salt in the soil and live through occasional overflows of brackish water. Such plants occupy the inner beach zone, further details concerning which are given later. Just outside of this zone, where the soil is a little wetter and there are small channels and sometimes ponds, is the marsh-hay zone. Finally, where salt water stands continuously and there are large channels or guts, lakes, or lagoons, comes the tall cordgrass or thatch grass. Such are the chief parts and plants of the Atlantic coast salt marshes (pl. 1, *A*). The extent of these zones depends on the flow of tide. On the northern Massachusetts coast it is estimated that the vertical scope of the zones is beach, 1 foot; marsh hay, 2 feet; and cordgrass, 6 feet.

The zones of salt-marsh plants are not stationary but rather may be regarded as ceaselessly shifting. In the relatively quiet waters where the marshes form, sand washed up by the tide and silt caught by such salt-water plants as seaweeds and eelgrass build up the bottom to the point that cordgrass can grow. This then occupies the soil with its dense and resistant root systems, entraps more mud, and holds the debris from its own annually replaced stems. As this new foundation for plants approaches the mean high-tide level, the marsh-hay types of plants take hold. These build again by catching sand washed in from the sea, and loam coming down from the land. Then goldenrod, hightide-bush, and groundselbush may get a start, further firm the soil, and make place for bayberry, chokeberry, wild rose, and other bird-borne plants. An island then is well on its course of development, and if man does not run fire or graze cattle over the area, it may become clothed with trees. Where the coast is sinking, however, building up must be only a preliminary to tearing down, and as the various zones of the marsh work inland, low islands, even if forested, must give way. When salt water kills their vegetation and the protecting belt of marsh moves landward, the islands are soon worn down by the wash of open water. All this is a slow, a very slow movement, however, and in a lifetime men may see of it only a step or two.

PLANTS OF THE ZONES AND THEIR VALUE TO WILDLIFE

On the Atlantic coast, seaweeds and algae in variety thrive both in the ocean itself and in saline sounds and lagoons where tidal movement is free. Eelgrass grows in similar waters from Beaufort, N. C., north, and turtlegrass and manateegrass on the Florida coast. Wigeongrass lives in usually more quiet and shallow pools and occurs in suitable places along the entire coast line.

EELGRASS

Eelgrass (*Zostera marina*) has narrow, tapelike, dark-green leaves growing from a jointed reddish rootstock, and bears its small barrel-shaped seeds in thin pods enclosed by the bases of the leaves. It inhabits a considerable range of depths and sometimes is left bare at low tide. In general it thrives best in water in which there is considerable tidal movement. It is a good wild-fowl food plant, and, having been the chief dependence of sea brant, its scarcity in recent years, due to a disease, has had an unfavorable effect on the numbers of that bird.[1] Eelgrass was eaten to a considerable extent also by the Canada goose, and its seeds by the black duck; it was taken in smaller quantity also by a variety of other waterfowl. The plant is known under a number of local names, as salt-water grass, sea grass, sea wrack, and sea hay. The last two names refer to the windrows of it cast up on the beach, particularly by winter storms. It dries and bleaches there and is used as bedding for domestic animals and for insulation and packing. When plentiful it has been harvested in large quantities for commercial purposes. The fluffy,

[1] For more complete information see the following: COTTAM, C. THE PRESENT SITUATION REGARDING EELGRASS (ZOSTERA MARINA). U. S. Dept. Agr. Wildlife Research and Management Leaflet BS–110, 7 pp. 1938. [Mimeographed.] Obtainable on request from the U. S. Bureau of Biological Survey, Washington, D. C.

dry "sea hay" is recognized as good nest-building material both by birds and mammals.

MANATEEGRASS AND TURTLEGRASS

Manateegrass (*Cymodocea manatorum*) and turtlegrass (*Thalassia testudinum*) are less conspicuous plants that grow near the bottom of the bays and creeks of the Florida coast. Their value as food for wildlife is not scientifically known, but the common names indicate that they have a popular reputation in that respect.

WIGEONGRASS

Wigeongrass (*Ruppia maritima*) has long, threadlike leaves, arising from a whitish, rather zigzag rootstock. The small, black, triangular seeds are borne singly on the tips of short stalks radiating from the end of a more or less lengthy and spiral stem. Wigeongrass grows in varying depths of water, sometimes in a few inches near the shore, sometimes at a depth of 10 feet or more. Though typically an inhabitant of brackish water, it thrives also in water that is nearly fresh and, at the other extreme, in lagoons concentrated by evaporation to a salinity greater than that of the sea. It is also adapted to strongly alkaline waters of the West, in which few other plants will grow. Wigeongrass is a wild-fowl food of the first rank, all parts of which are eaten.

CORDGRASS

Cordgrass, or thatch grass (*Spartina cynosuroides*), occupies deeper water than any of the other salt-marsh plants, except the strictly submerged eelgrass and wigeongrass, and makes up nine-tenths or more of all the vegetation of its zone. This grass extends in depth from the level of ordinary high tide nearly to that of mean low tide. Consequently a considerable part of its total height is submerged at high tide. Cordgrass is a true grass, not a "called" one like those just referred to. It has a rather stiff, leafy stalk, as much as 10 feet tall, a flowering and fruiting head composed of feather-like parts, and a wiry rootstock. Cordgrass is sometimes used for bedding or mulch. It has little food value for wildlife but makes a good cover for rails and smaller birds, some of which nest in it, especially where bunches of dry eelgrass or other drift have lodged. Plate 1, *B*, illustrates a fresh-water species of cordgrass.

BLACK GRASS

Areas inside the cordgrass zone that are not covered by ordinary high tides, but are subject to flooding by spring and other exceptionally full tides, have a variety of vegetation in which at different points black grass, bulrushes, cattails (pl. 1, *C*), or marsh hay may predominate. Black grass (*Juncus gerardi*), so called from its very dark-green color, which is almost black in fall, slender and needle-pointed at the top, with a tuft of flowers or seeds at the side, makes large and dense stands but nevertheless permits the growth of numerous other salt-marsh plants within its domain. It is of no known value as a wildlife food plant.

BULRUSHES

Bulrushes of the salt marsh (pl. 1, *C*) have triangular stems and tufts of flowers or seeds near the top. In the so-called three-square

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A, Saltmarsh vegetation, chiefly cordgrass; *B*, cordgrass; *C*, cattails and bulrushes.

(*Scirpus americanus*), without leafy stems, these tufts are lateral, and in the larger leafy-stemmed salt-marsh bulrush (*S. robustus*) they are terminal. From their fruiting heads can be ground out in the palm large numbers of shiny brown seeds. These are eaten freely by waterfowl and in some localities are an important food supply. Bulrushes are a favorite food of muskrats and are used also as material for the winter houses of these animals.

MARSH HAY

Marsh hay is a term that covers a slender cordgrass (*Spartina glabra*), saltgrass (*Distichlis spicata*), and a few other species. A striking characteristic of marsh hay, after it has attained height growth, is a "lodged" appearance, as if some force had "frozen" it in the form of waves left by the last strong wind. A variety of other plants may be scattered about in this zone of the salt marsh, and more birds nest here than elsewhere. Flowers that may attract attention are the marsh rosemary (*Limonium carolinianum*), with its delicate sprays of tiny lavender blossoms, growing all the way along the coast; and sea oxeye (*Borrichia frutescens*), with buttonlike heads, yellow in flower, purplish-brown in fruit, from Virginia southward. The seeds of some of the plants, including those of saltgrass and small sedges among the marsh hay, are sometimes eaten, but with one exception they are not known to be of much food value. The exception is arrowgrasses (*Triglochin* spp.), plants with fleshy leaves at base and a slender stalk bearing three-parted green fruits, sometimes locally important as food for wild ducks. Salt-marsh hay has at times been important and thriftily harvested, but now it appears to be little used.

GLASSWORT

A salt-marsh plant sure to attract attention is one that has fleshy, watery-looking, jointed stems, and grows in places made so salt by repeated flooding and evaporation that they are bare of other vegetation. Known under a variety of names as, saltwort, pickle grass, or samphire (*Salicornia* spp.), this plant is pale green in summer but turns scarlet in fall. Locally its seeds may be important as food for wild ducks, and the fleshy parts are said to be cropped by wild geese.

REED

The cosmopolitan common reed (*Phragmites communis*), while not characteristic of strongly saline situations, grows along the landward side of salt marshes and apparently has increased in recent years. Reed grows to 6 to 12 feet or more high, has a strong stem, and bears an ornamental tawny, plumelike head. The stems are widely used for thatching and for the construction of light fences, lattices, screens, and mats. It is of no use to wildlife except for cover.

OTHER VEGETATION

The zone of transition from marsh to upland vegetation contains such growths as rosemallow (*Hibiscus moscheutos*) with pink flowers some inches across; the groundselbush (*Baccharis halimifolia*) covered in fall with the glistening white parachute hairs of its seeds; switch-

grass (*Panicum virgatum*), the seeds of which are a bird food; orach (*Atriplex patula*); and seaside goldenrod (*Solidago sempervirens*). The leaves of orach, arrowheadlike, and those of the seaside goldenrod, lance-shaped, are somewhat thickened, a characteristic of many salt-tolerating plants. The orach may be browsed by geese, or its seeds eaten by various birds, but the goldenrod is not known to be so used.

Salt marshes may at first glance seem monotonous, but they have a variety and play of color not lost on the attentive observer. In summer the cordgrass is light green, the marsh hay darker, and the black grass very dark. In fall all fade to russet, and in winter to straw. The patches of samphire, or pickle grass, soft green in summer, turn red or even scarlet in fall.

BIRDS: MORE CHARACTERISTIC SPECIES

The discussion of the birds of the salt marsh may be divided into two parts, the first relating to species that either breed in or closely frequent the usual salt-marsh vegetation; and the second, treating those that visit the marshes but do not breed in them, except in trees that are not really part of the salt-marsh vegetation. This second section also includes birds whose true breeding home is in inland wooded swamps or on bare beaches and islands, but which may frequently fly over or even descend to feed in salt marshes. Birds of the first classification are the more characteristic species. Birds of the second are treated under the heading "Less characteristic species" (p. 12). Highly characteristic birds of the salt marches are certain rails and sparrows. Other species that breed in the marshes include the black duck, blue-winged teal, bittern, certain shore birds, marsh hawk, short-eared owl, red-winged blackbird, and the marsh wren. The birds that nest on beaches and sandy islands are not considered here, though some of them that feed in, or otherwise resort to, salt marshes, will be referred to later.

RAILS

A bird family highly characteristic of the salt marshes is that of the rails, and the most representative member of the family is the clapper rail (*Rallus longirostris*), known also as marsh or meadow hen. While rails abound in salt marshes, a casual observer might spend considerable time in these areas and never see one, for they are retiring and elusive and are most active in the morning and evening hours when the transient observer is least likely to be in the marshes. By going at those times, however, or by proceeding cautiously and quietly at others, the bird watcher may occasionally have an opportunity to see rails.

All of the group are narrow-bodied birds that slip about among the dense vegetation of the salt marsh so readily that capture by direct pursuit probably is not within the power of any of their enemies. The clapper rail (fig. 1), about the size of a one-third-grown Leghorn chicken, is largely grayish, with some olive on the back and buffy on the breast. It is always in the salt marshes, passing even the winter there, from New Jersey southward. The king rail (*R. elegans*), while chiefly an inhabitant of fresh-water marshes, oc-

casionally is seen in the salt marshes. It is of about the same size as the marsh hen, but is darker above and much more reddish brown below. The Virginia rail (*R. limicola*), half the size of the king rail, and of about the same general coloration, has a distinctly reddish patch on each wing. It may be seen in the salt marshes at all seasons, but more often in winter. The sora (*Porzana carolina*), a little smaller than the Virginia rail, is mostly olive brown above and blue gray below, with a black marking over the crown, about the base of bill, and on the throat. The sora is chiefly a fresh-marsh species, but it may sometimes be seen in the salt marshes and winters in them from the Carolinas south. Two smaller species, the yellow rail (*Coturnicops noveboracensis*) and the black rail (*Creciscus jamaicensis*), and thus sufficiently described, inhabit the marshes, but they are so rare or elusive, or both, that they are not often seen. All rails have light and dark barrings on the flanks.

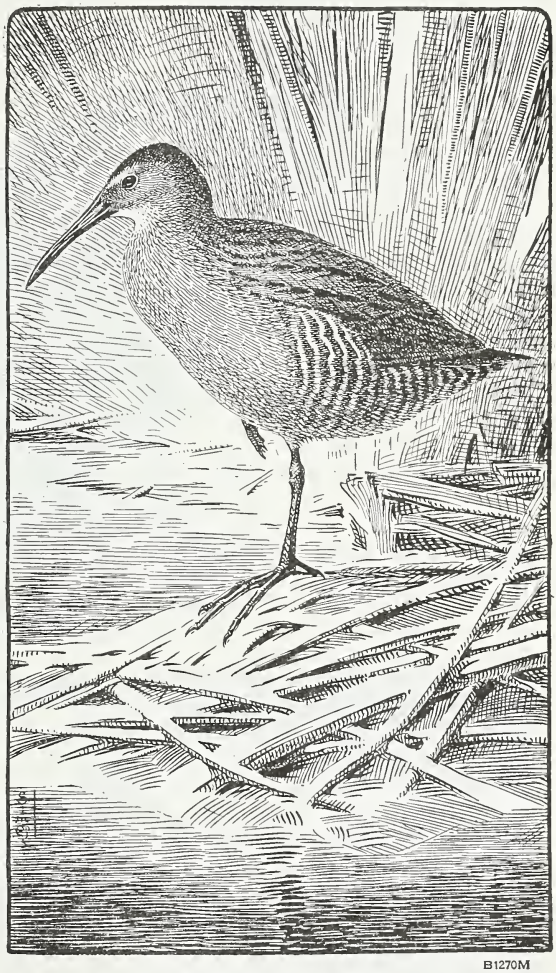

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FIGURE 1.—Clapper rail.

Rails tend to be most active in the evening, and the marsh then may resound with their distinctive calls. Their nests are on or near the ground, or supported just over the water, and are usually well concealed. The eggs are pale with dark spottings and often are laid in considerable number, clutches varying from 5 to 15.

The food habits of the rails have not been much studied. The sora habitually fattens in wildrice marshes (fresh) in fall, and the other species, except the clapper rail, frequent these areas to some extent. Rails are known to feed on insects, snails, and small crustaceans, the clapper rail being reported to devour many fiddler crabs. The birds

are protected by law, but as they are classed as game, an open season is provided for hunting them.

SPARROWS

Birds of another group that is just as characteristic of the salt marshes as the rails, and just as elusive, but much smaller, are the sharp-tailed sparrow (*Ammospiza caudacuta*) and seaside sparrow (*A. maritima*). Like many other sparrows they tend to be streaky both above and below, and they have touches of yellow on the sides. They are about as difficult to observe as mice and appear not unlike those small mammals during the brief glimpses that are about all that can be obtained of them. When forced to take wing, they flutter only a short distance and drop again into their haven—the marsh. Their songs are unimpressive. Their nests are built in crannies among drift, often of dried eelgrass. Both of these sparrows feed on insects, spiders, snails, and sand fleas, which make up about four-fifths of their food; the seeds of grasses and other plants constitute the other fifth. They are in the marshes at all seasons, but there is some shifting to the southward, at least by the northern colonies.

Rather close relatives of the true salt-marsh sparrows are the Savannah and grasshopper sparrows, which have extensive inland breeding ranges but sometimes nest in parts of the salt marshes that are not too wet. They are not easily distinguished by the lay observer, but the song of the grasshopper sparrow is recognizable as being like that of some of the insects for which the bird is named.

DUCKS

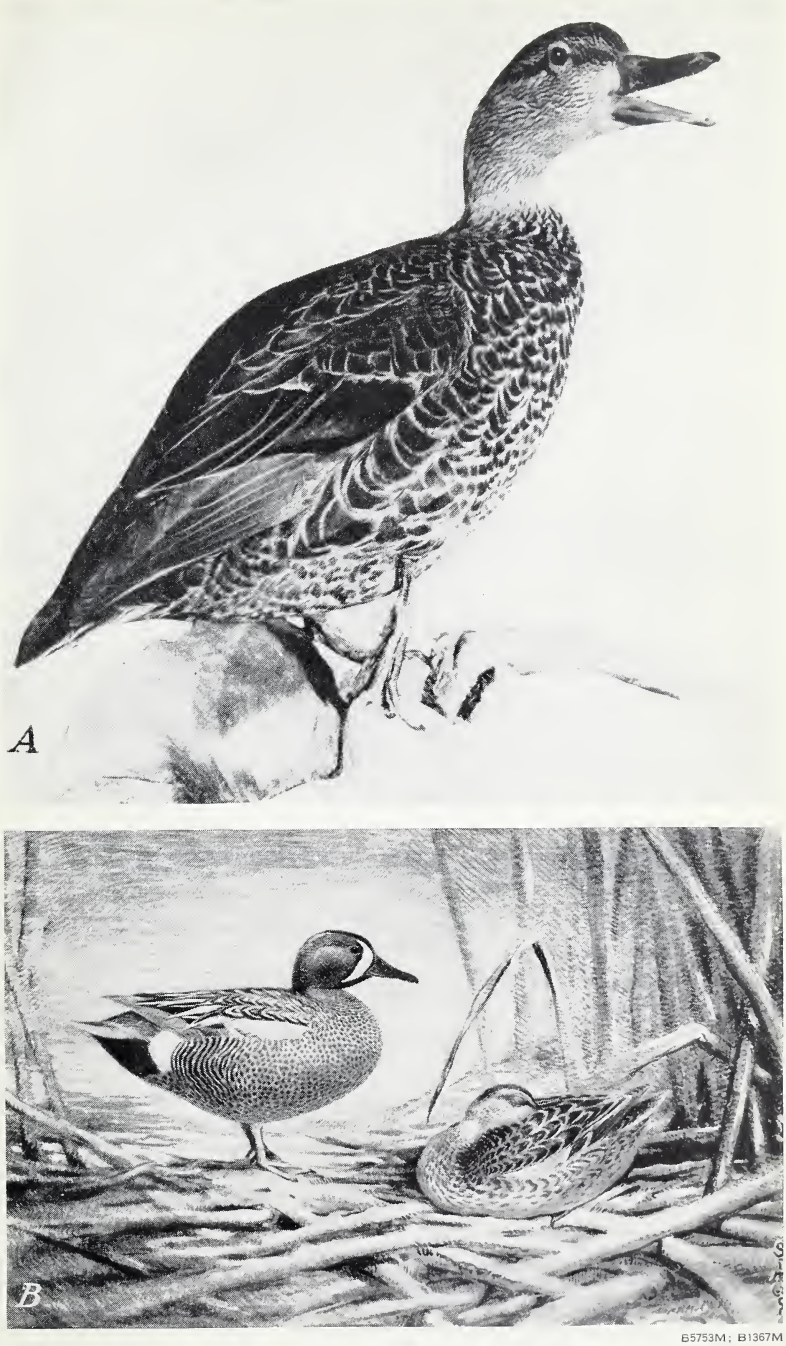
Black ducks (*Anas rubripes*) (pl. 2, *A*) are heavy-bodied birds of prevailing dark color, with the lining of the wings white, a character well shown in flight. The female, though smaller than the male, does the talking for the family, having a loud, harsh quack, of which the male's softer note seems a faint echo. Black ducks are usually seen in pairs, and in flight the female leads the way, the male following her every turn and twist.

The blue-winged teal (*Querquedula discors*) (pl. 2, *B*) is but little more than a third the bulk of the black duck. The male has a conspicuous white crescent in front of the eye, and both sexes have a large blue patch on the wing, which shows well in flight but often appears white unless the light is favorable. The female utters a low quack, and the male a whistling peep.

Both species make their nests of a variety of dry plant fragments and line them with their own down, part of which is dragged over the eggs when the sitting bird leaves of its own accord. The number of eggs, which are white or buffy, varies from 5 to 15.

Both of these ducks breed in the salt marshes from Virginia north. Black ducks may be seen along the entire coast line in winter, and blue-winged teals from Maryland southward.

The food of the black duck is about three-fourths vegetable and one-fourth animal. Pondweeds, including both the eelgrass and wigeongrass of salt and brackish water, are the most important vegetable foods, followed by the seeds of grasses, sedges, and smartweeds. About half the animal food consists of small snails and mussels, the common blue mussel being frequently taken. Sand fleas, shrimps, crabs, insects, small fishes, and fish eggs also are eaten.



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A, Black duck; *B*, blue-winged teal.

The blue-winged teal takes about seven-tenths vegetable and three-tenths animal food. Sedges, pondweeds, grasses, and smartweeds furnish most of the vegetable food, and snails, insects, and crustaceans the bulk of the animal. These birds rarely cause damage to man's interests through their feeding habits, and they are important representatives of the wild-fowl group that almost as a whole has been so reduced in numbers in recent years as to demand the most careful protection.

BITTERN

The common bittern (*Botaurus lentiginosus*) seems to be the only one of the heron tribe that nests in the Atlantic coast salt marshes. An obvious reason is that it regularly nests on the ground, while the others usually build in trees. A rude platform of matted vegetation suffices for a nest, into which are deposited usually four to six pale-brownish eggs. The bittern is light brown above and streaked with that color and white below. It has a habit of "freezing" in an erect position when surprised, thus looking quite sticklike. Its strange notes in the mating season have earned it some interesting names, as dunk-a-doo, thunder-pump, and stake-driver. During spring evenings, when heard distinctly, this call sounds like *plunk-a-lunk*, but when coming from a distance, or when indistinctly perceived, seems like *lunk*, *lunk*, suggesting the name "stake-driver." The bittern does not depend on fishes for food to so great an extent as commonly supposed but takes considerable numbers of crawfishes and other crustaceans, and even a good many mice. It breeds from the Carolinas north and winters from Massachusetts south, though uncommonly at the extremes of these seasonal ranges.

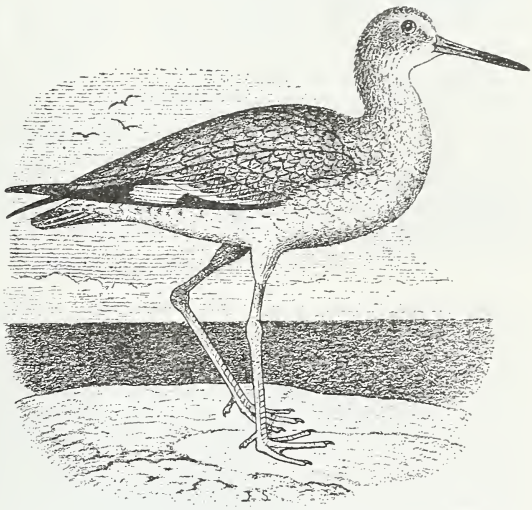

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FIGURE 2.—Willet.

WILLET

Of the group of shore birds that includes the snipes, sandpipers, plovers, and their allies, relatively few nest in the salt marshes, and of those, only one, the willet (*Catoptrophorus semipalmatus*) (fig. 2), is conspicuous enough to attract much attention. It is above average size for a shore bird, being 14 to 16 inches long and having a wing spread of 24 to 29 inches. Though of plain colors, gray above and white below, the bird is recognizable on the wing and as it alights with upraised wings, by a broad white band extending

the whole length of each. The willet is sometimes noisy, and a common call, an oft-repeated *pil-willet*, shows that it is one of the birds that have named themselves. The nest is a slight hollow lined with grass; the number of eggs is four (as is usual with shore birds), and their color variable, white to olive, spotted with brown to purplish. The willet breeds from New Jersey, and winters from South Carolina, southward. Its food is reported to be insects, mollusks, crustaceans, and small fishes, together with a slight admixture of vegetable material.

MARSH HAWK

The marsh hawk (*Circus hudsonius*) is easily recognized, being the only member of its group that has the rump white. This character has given a related European species the name of ring-tailed hawk. The marsh hawk appears to fly about somewhat lazily, usually not far above the cover it is beating and into which it drops at any chance of catching prey, and may be seen in all Atlantic coast salt marshes at all seasons. It feeds in about equal proportions on mice and birds but captures a variety of other small creatures also and is not averse to partaking of carrion. In some cases, from man's point of view, its numbers may appear to be in need of control. The nest may be only a flattened place in marsh vegetation but sometimes is built up a little with sticks or other material. Usually three to six eggs are laid, bluish or greenish white, sometimes faintly spotted.

SHORT-EARED OWL

The short-eared owl (*Asia flammeus*) lives in almost all parts of the world but, breeding in open grassy lands, is quite at home in salt marshes. The body coloration is tawny streaked with dark brown, and large feathers of the wing and tail show considerable patches of tawny. The bird is 12 to 17 inches long but has a wingspread of 38 to 44 inches. The name refers to two short tufts of feathers above the space between the eyes. Expert and noiseless in flight, it flies more by day than most of the owls. It preys chiefly on mice and scatters over the marsh pellets consisting of mouse bones encased in balls of fur, remains of its meals that are ejected from the mouth.

RED-WINGED BLACKBIRD

The red-winged blackbird (*Agelaius phoeniceus*) (fig. 3) inhabits the whole United States, so perhaps needs no introduction other than calling attention to its bright-red, yellow-bordered epaulets, and its gurgling *okalee* call. This is uttered at almost regular intervals by the males in spring after they have reached the breeding grounds and "staked out a claim," where they await the coming of their mates. Redwings may be seen along the entire coast line in summer, and from Massachusetts south in winter. The birds are distinctly migratory, however, and the summer and winter populations of a given area no doubt are almost always different groups of individuals. The female is smaller, brownish black above, and more or less buffy and dark streaked below. The sexes share a *chuck* note that is uttered often. This blackbird frequently builds its grassy nest

among the stalks of marsh plants, but sometimes also in bushes. The eggs, two to five in number, are pale bluish green, spotted, blotched, and scrawled with brown to purplish. When scattered, redwings probably do more good than harm by their feeding habits, but when congregated in great numbers in grainfields after the breeding season, they may be disastrous and in need of control.

FIGURE 3.—Red-winged blackbird.

MEADOWLARK

The meadowlark (*Sturnella magna*) (fig. 4), a plump bird, brownish above, yellow below, with a black crescent on the breast and white feathers on each side of the tail showing plainly in flight, may be found in the marsh-hay zone of the salt marshes in winter, and it

FIGURE 4.—Meadowlark

breeds in this zone from Virginia north. It is sometimes called marsh quail and formerly was used as a game bird. It is a highly insectivorous species, however, and deserves protection, except on forays into fields of sprouting corn, peas, and peanuts, and into ripening tomatoes in the South during its spring migration. Permits to

shoot the birds under such circumstances have been granted, but in general the meadowlark well merits the legal protection it receives. Grasshoppers, beetles, bugs, and caterpillars are its leading kinds of animal food. The meadowlark builds its nest in grass, usually leaving an arch of vegetation over it so that it is not easy to find. The eggs are three to seven, white, blotched, and speckled with brown, purple, or lavender.

MARSH WREN

Marsh wrens (*Telmatodytes palustris*) in various slightly differing forms breed in suitable places throughout the country and winter sparingly from New Jersey south. Atlantic coast salt marshes are favorite haunts, especially the areas occupied by cattails. Like all wrens these little birds are the embodiment of restless energy, and they sing over and over a hurried series of bubbling, lilting notes. Besides the globular nest woven among and largely composed of cattails and lined with their down, in which the 5 to 10 pale-brown to chocolate eggs are laid, the marsh wren builds various extra dummy nests that, unless used as sleeping quarters for the male, seem of no use except to keep that tireless fellow busy in their construction. The food of marsh wrens seems to be a fair sample of the insects and other small organisms of their highly aquatic environment.

BIRDS: LESS CHARACTERISTIC SPECIES

Most of the common birds of the eastern United States may occasionally be seen in or about salt marshes. The number to be treated in this relatively brief account must be restricted, however, to the most frequent or conspicuous visitors.

HERONS AND EGRETS

All the herons frequent salt marshes more or less, and besides the bittern, previously described among the more characteristic birds, the great blue heron, little blue heron, Louisiana heron, green heron, night heron, and the egrets may from time to time come to notice. All herons fly with the neck drawn in and the legs extended behind. The great blue heron (*Ardea herodias*) (pl. 3, *A*) may occur in the salt marshes at all seasons. It stands about 3½ feet high and when in the air flaps its large wings slowly with a characteristic undulatory motion. The great blue heron is an expert spearer of fish but on the whole takes more of the noncommercial than of the commercial species, if for no other reason than that the former are more common.[2] A good many great blue herons are killed under permit about fish hatcheries and rearing ponds, but it would be better, where at all feasible, to screen the ponds.[3] Shooting herons at the breeding colonies is indefensible. Moreover, it is illegal, as the birds are protected by Federal law.

The little blue heron (*Florida caerulea*) is about half the size of the great blue heron and when adult is chiefly dark slate blue, while

[2] For further information see the following: COTTAM, C., and UHLER, F. M. BIRDS IN RELATION TO FISHES. U. S. Department of Agriculture. Wildlife Research and Management Leaflet BS–83, 16 pp. 1937. [Mimeographed.] Obtainable on request from the U. S. Bureau of Biological Survey, Washington, D. C.

[3] For suggestions on screening ponds see the following publication: MCATEE, W. L., and PIPER, S. E. EXCLUDING BIRDS FROM RESERVOIRS AND FISHPONDS. U. S. Department of Agriculture Leaflet 120, 6 pp., illus. 1936. Obtainable from the Superintendent of Documents, Washington, D. C., for 5 cents a copy, stamps not accepted.

B1635M; B3753M

A, Great blue heron; *B*, greater yellowlegs.

the larger bird is grayish blue. The young are often white, but intermediate, spotted forms also occur. The dark bill and the smaller size of the white phase distinguish it from the large egret, and the greenish legs and dark feet from the small egret. Late in summer the little blue heron may be seen almost anywhere along the coast, but in winter and early summer as a rule only from North Carolina southward.

The egrets are white, the large or American egret (*Casmerodius albus*) having a yellow bill, and the small or snowy egret (*Egretta thula*) yellow feet. These points must be seen to insure positive identification. The former is about two-thirds, the latter about one-third, the size of the great blue heron. The large egret breeds from New Jersey south, wanders extensively in summer and early fall, going north even into Canada, and retires in winter to the Gulf coast and southward. The small egret formerly bred as far north as New Jersey but now nests from North Carolina southward. In summer it wanders to the same extent as the large species, then returns to its southern breeding range for winter quarters.

The egrets formerly were especially persecuted for their plumes, or aigrettes, a practice that has not yet been entirely suppressed. It has been stopped to such an extent, however, that the birds have increased from numbers that were approaching the disappearing point to relative abundance, the large species recovering more rapidly than the small. In the first stages of the recovery process, the birds resumed their northern wanderings in steadily increasing numbers and to more and more distant points, and later they reestablished breeding colonies at points farther and farther to the north, where they had formerly bred. The contraction of their populations to the south as their numbers decreased is an interesting phenomenon, as the northern colonies were the least molested, the war of the plume traders upon the birds being most intensive in the South.

The Louisiana heron (*Hydranassa tricolor*), which is of about the same size as the little blue heron, may be seen from the Carolinas south. Standing, it appears more slender than other herons; on the wing, the dark head and neck, contrasting with the white body, distinguish it. The green heron (*Butorides virescens*), the smallest of the tribe here described, is about the bulk of a crow and appears dark, although it is greenish above and reddish below. It frequents bodies of water in woodlands but may occasionally visit salt marshes. It winters from South Carolina southward.

The black-crowned night heron (*Nycticorax nycticorax*) may be seen in summer anywhere along the coast, and in winter from Virginia (casually from Massachusetts) south. Its bill is proportionately thicker at the base than those of other herons; the top of the head is black, and the general body color is bluish gray. The young in their first winter are grayish brown, spotted and streaked with white and rusty. Night herons nest in colonies in trees, often near the coast, may visit salt marshes at that season in search of food, and at other seasons may adopt the marshes as hunting grounds for protracted periods. They are seen mostly in evenings and early mornings but, true to their name, are active throughout the night.

Besides the bittern, the vocal accomplishments of which already have been mentioned (p. 9), other herons attract attention by pe-

culiar and usually harsh notes that in a number of cases have suggested local names for the species. When startled, the great blue heron gets under way with raucous croaks and squawks, sounding much like cussing, and in some places it has, therefore, been called "cranky." The green heron under similar circumstances arises with a *skeow*, which earn it such names as "scouck," "scout," and "cow-cow." The night heron often cries *quock*, and so has been termed "quawk," "wop," and "qua-bird."

GULLS, TERNS, AND SKIMMERS

Gulls and terns breed chiefly on islands and beaches, but they are free-flying fowl, and from time to time several kinds may be seen in the salt marshes. Some of these birds are rare or difficult to distinguish and are best omitted from an account like the present. The

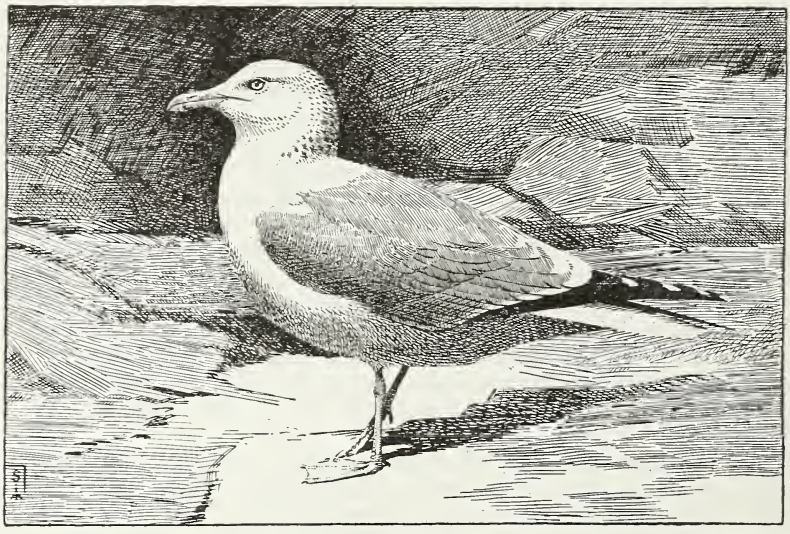

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FIGURE 5.—Herring gull.

most common gull on the Atlantic coast from fall to spring is the herring, or harbor, gull, the common sea gull (*Larus argentatus*) (fig. 5). It is somewhat larger than a crow; the back and most of the wing are pearl gray, the head, underside, and tail white, and the tips of the wing barred black and white. It breeds from Massachusetts north and west and winters along the whole coast, from which in fact it is entirely absent only a few weeks in summer.

A similar-appearing but somewhat smaller species, the ring-billed gull (*L. delawarensis*), can be surely identified in the field only by a black cross bar near the tip of the bill.

The laughing gull and Bonaparte's gull are common representatives of another group—the black-headed gulls. Adults in breeding plumage are easily recognized; but in winter the black on the head mostly disappears, and the young do not attain the full breeding plumage until the second spring after the year in which they were hatched. In this group the laughing gull (*L. atricilla*) is a little

larger, with leaden-gray back and wings; Bonaparte's gull (*L. philadelphia*) a little smaller, with pearl-gray back and wings and the bill more slender. The laughing gull breeds commonly along the whole coast line and winters from the Carolinas south. Bonaparte's gull breeds in the northern interior part of the continent and winters along the coast from Massachusetts southward.

Gulls feed on almost anything available, hence figure largely as scavengers. They take insects, however, as well as mollusks, crustaceans, and fishes, but as they rarely dive, are not well adapted to catching live fishes. On the Maine coast, where herring gulls increased so much as to become objectionably destructive to eggs of other birds and to fishes, clams, and blueberries, steps have been taken to control their numbers.

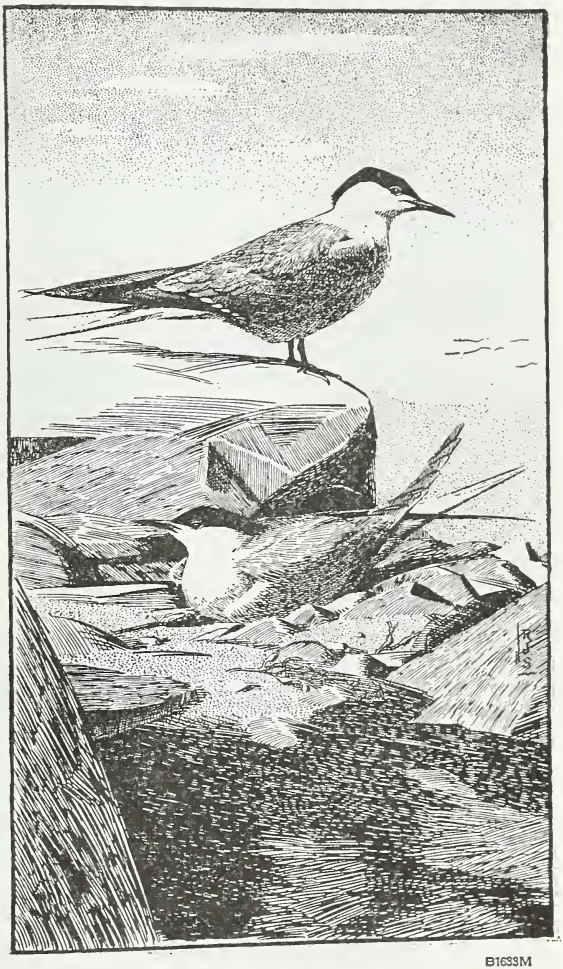

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FIGURE 6.—Common tern.

Terns have the bill more slender and pointed, as compared with the stout bill with down-curved tip of the common gulls, and on the wing they point the bill more directly downward. Expert as gulls are in flight, they are surpassed in this respect by terns, which because of this skill are commonly called sea swallows. Adult terns have the top of the head black and even in immature plumage have a broad dark line from the eye back around the nape. The crown feathers are more or less elongated so as to form a slight crest posteriorly. The birds are mostly pearl gray in color and have the tail more or less deeply forked.

The least tern (*Sterna antillarum*), less than 10 inches long, is the only tern that in summer has a bar of white on the forehead in front of the black cap. It breeds on islands and beaches from Massachusetts south and winters from the Gulf coast southward.

Terns 14 to 16 inches in length include the common tern (*S. hirundo*) (fig. 6) and Forster's tern (*S. forsteri*), too nearly alike for easy field identification. Both occur along the coast in migration. The common tern breeds in New England, and both winter from the South Atlantic coast southward.

The Caspian tern (*Hydroprogne caspia*) and the royal tern (*Thalasseus maximus*) are another pair of similar appearance. They are larger birds, about the size of crows, with reddish-orange bills, the royal having the tail about twice as deeply forked as the Caspian. Both may be seen on the South Atlantic coast in winter, and both breed north to Virginia. The Caspian tern is seen farther north in migration to and from breeding grounds in the northern interior.

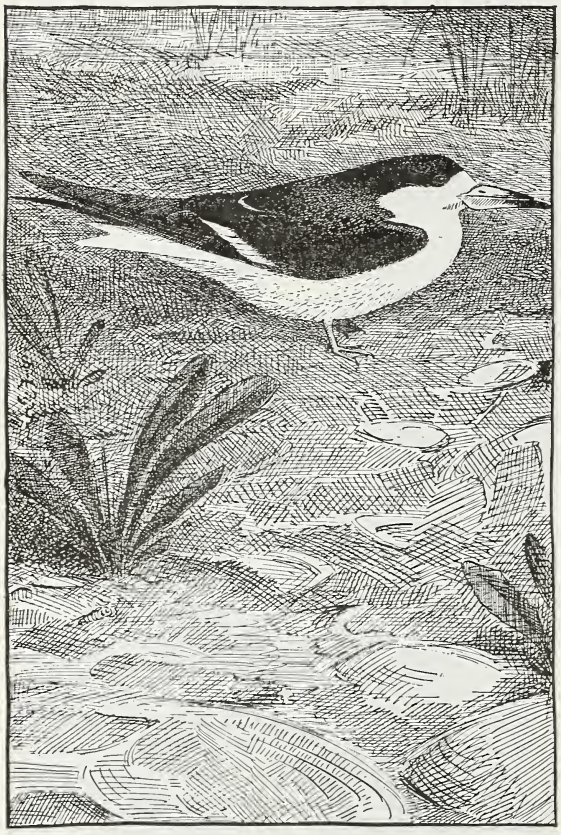

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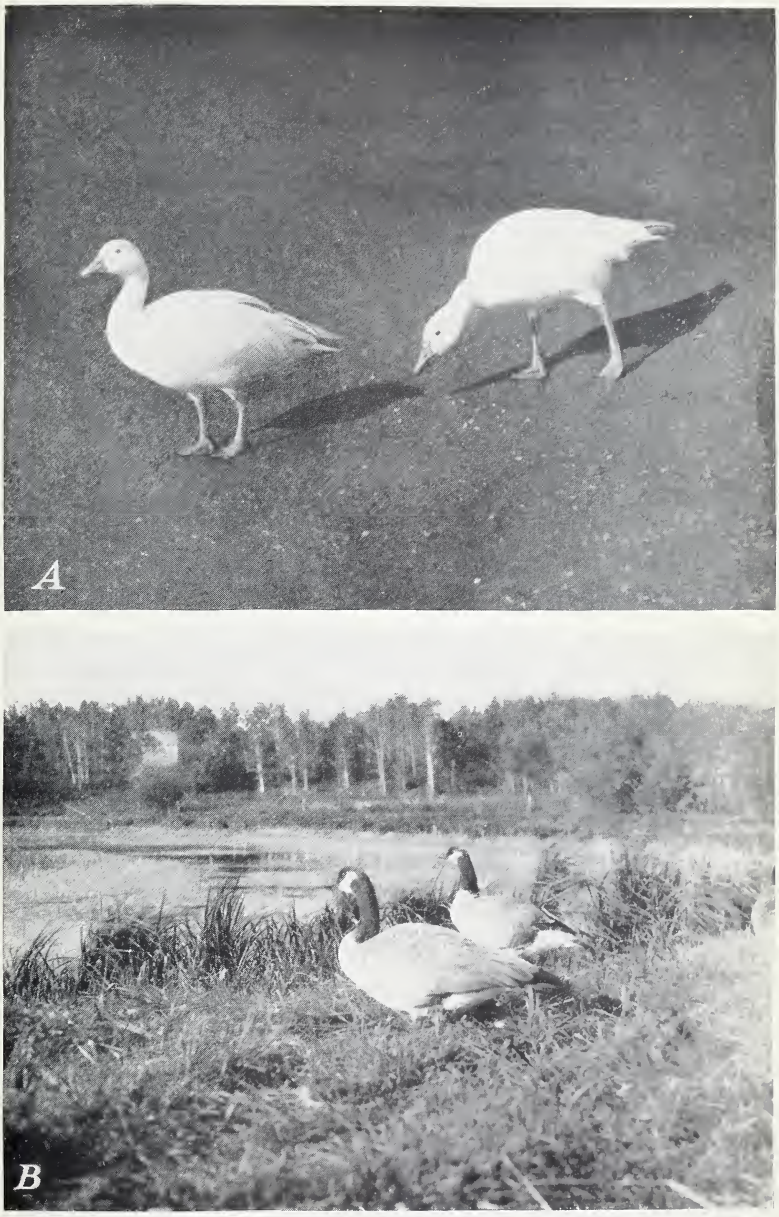
FIGURE 7.—Black skimmer.

The black tern (*Chlidonias nigra*), easily recognizable by its generally sooty color, is rather rare in spring on the Atlantic coast. This species may be more numerous in late summer but is then in very different dress. It breeds chiefly inland.

Terns seldom share the carrion-eating propensities of gulls but capture their prey alive, either on the wing or, if in water, by plunging. Small fishes, shrimps, and aquatic insects are taken by partial diving, and a variety of insects by snatching them in the air. The black tern is more pronouncedly insectivorous than the others.

All the gulls and terns here mentioned are protected by Federal law.

The black skimmer (*Rynchops nigra*) (fig. 7), a peculiar and striking bird, related to terns and as large as any American species, may sometimes be seen about salt marshes. It breeds on beaches and bare islands as far north as New Jersey and winters from Florida (occasionally South Carolina) southward. It is dusky brown above, with the forehead, lower parts, and the hind border of the wing feathers



B36M; B24953

A, Snow geese; *B*, Canada geese.

as seen in flight, white. The bill, its most peculiar feature, is much longer than the head, flattened from side to side like a knife, with the lower part projecting considerably beyond the upper. The bird often flies close to the surface, with the narrowed bill plowing through the water, a habit that has suggested the names "cutwater" and "shearwater." The food is small fishes, so far as known, of kinds not used by man. Skimmers are wonderfully good fliers, and flocks carry on elaborate maneuvers in swift unison. One is tempted to call the flocks "packs," as a common call of the birds sounds like the yelping of dogs.

WATERFOWL

In addition to the breeding black duck, and the blue-winged teal (p. 8), a large number of migratory species of waterfowl may be seen on the salt marshes, though in this circular it is hardly practicable to detail their recognition marks. The ducks can be recognized as such even by those with the least ornithological experience. They are the precious survivors of a very important group of American birds, now so greatly reduced in numbers that some of the species are in danger of being exterminated and all need earnest and sympathetic attention.

The mergansers, or fish ducks, not being hunted, have held their numbers better than other ducks. The red-breasted merganser (*Mergus serrator*) is the species most likely to be seen in salt water. Its narrow saw-toothed bill and crested head are characteristics shared with other mergansers. The male has a greenish-black head and back, white neck and wings, a reddish-brown and spotted upper breast, and finely barred black-and-white sides. The female and young are much plainer, with the head and neck cinnamon and the back grayish brown. It may occur in winter anywhere along the coast, but in the East does not breed south of Massachusetts.

Three of the goose tribe should be mentioned: The Canada goose, the brant, and the snow goose. The Canada goose (*Branta canadensis*) (pl. 4, *B*) is mostly brownish-gray, the underparts paler, and the head and neck black, with a well-marked white throat patch. This is our most common goose, and because it breeds mostly far to the north away from man's influence and has great natural sagacity and wariness, it has held its numbers very well. It is the species usually seen flying in V-formation, as it migrates more by day than do the others. Its well-known call has given it the name of "honker." Canada geese usually weigh 8 to 12 pounds. They may be seen along the whole coast in winter, though they are rare at the extreme south.

Any goose other than the Canada is likely to be called brant, and the name is therefore heard in all parts of the country. The true sea brant or American brant (*Branta bernicla*), however, is closely confined to the coast from North Carolina northward and is so maritime in habit that it is often remarked that the birds will go out of their way rather than fly over land. In general coloration they are much like the Canada goose, but have only a few touches of white on the side of the neck, and the breast is black. They are considerably smaller, being about one-third of the bulk of the honker. When eelgrass was abundant, brant fed chiefly upon it, but now that it is scarce they take more seaweeds and other foods. The decline

of eelgrass was accompanied by a drop in the numbers of brant, and the birds were given additional protection.

The snow goose (*Chen hyperborea*) (pl. 4, *A*), a little smaller than the Canada goose, is white with black wing tips. It nests far north and winters on the Middle Atlantic coast, being seen as a migrant or straggler, however, both north and south of that section. The main population of these birds passes the winter in the sand-dune country along the coasts of Virginia and North Carolina, where they arrive and from which they depart almost in a body. These geese do not spend much time in or about the water, a habit that has protected them from gunners. Their whole population is concentrated in a limited area, however, and they have consequently received complete legal protection ever since the passage of the Migratory Bird Treaty Act in 1918. Geese are grazers, cropping to a considerable extent the stems and leaves and also digging up the roots of grasses and sedges. This has enabled the snow goose to stick to the sand hills, where it finds food readily obtainable and enjoys a great degree of safety from hunters. The Canada goose also grazes extensively but spends much time on the water and consumes a great deal of aquatic vegetation.

A larger, long-necked, entirely white-feathered bird that may be seen on the marshes is the whistling swan (*Cygnus columbianus*). It winters chiefly from New Jersey to North Carolina but in migration is occasionally seen northward on the way to and from its Arctic breeding grounds. Most of the swan population of eastern North America concentrates on the Middle Atlantic coast in winter, a habit that would be fatal if hunting were permitted. The birds have accordingly been strictly protected since 1918.

SHORE BIRDS

About 40 kinds of shore birds, one of which, the willet, has already been discussed (p. 9), occur on the Atlantic coast. Some of them seem to resort chiefly to the beach, others to the marsh, but considerable interchange takes place. The shore birds include many species of very similar appearance and can be distinguished only by rather subtle characters. It is impracticable, therefore, to deal here with any besides the most conspicuous or most common species.

One of the most showy, certainly, is the oyster catcher (*Haematopus palliatus*), as big as a crow, with much black and white in the plumage, and a large red bill. This bill is hard and strong, and the bird actually feeds on oysters and other shellfish. Oyster catchers are not numerous, do not range so far north as formerly, and are always in need of protection. Fortunately the Cape Romain Migratory Bird Refuge, S. C., is so situated as to give them a harbor both winter and summer. They are, moreover, protected by law at all times.

Plovers seem to have shorter necks and bigger heads than most other shore birds and also have a full-breasted "chesty" appearance. Wilson's plover (*Pagolla wilsonia*) is the largest of the "ring plovers" of the coast—species that have a dark band across the upper breast. It is grayish brown above and white below and about 8 inches long. It breeds from southern Virginia southward but is seen as a casual visitor farther north. The black-bellied plover

(*Squatarola squatarola*), easily recognizable by the black underparts of the breeding dress, is nondescript streaky gray in other plumages. Under proper conditions a group of black feathers may be seen under the wing, and they serve positively to identify the species. The bird, 10 to 13 inches long, is the largest of American plovers. The characteristic flight call is a clear ringing *pee-oo-ee*. The black-bellied plover occurs on the beaches, mud flats, and salt meadows during a rather long-drawn-out migration season. It is one of the species that from their extended migrations have been dubbed "globe-spanners;" it breeds on the Arctic coast of North America and winters as far south as Brazil.

Curlews are shore birds with long or very long bills that have a decided downward curvature. Of the three species formerly frequenting the Atlantic coast, one, the Eskimo curlew (*Phaeopus borealis*), seems to be extinct, and another, the long-billed (*Numenius americanus*), is quite rare. Intermediate in size and length of bill, the Hudsonian curlew (*P. hudsonicus*) has benefited by the protection afforded by the Migratory Bird Treaty Act of 1918 and during migration may be seen in considerable numbers on the Middle Atlantic coast from New Jersey to the Eastern Shore of Virginia. The bird is variegated with brown and white, darker above, paler below, and is 15 to 18 inches long. A common musical whistle *cur-lew* tells how these birds got their name. It is another great traveler, breeding in Arctic North America and wintering south to southern Chile.

Among more familiar shore birds to be seen in and about salt marshes are the yellowlegs, dowitcher, pectoral sandpiper, and least sandpiper. The two species of yellowlegs are colored alike, (1) in being true to their name—the long legs being bright yellow—and (2) in being dusky, speckled with paler above, and whitish below, more or less streaked or marbled with dusky. Their bills are of moderate length (one and one-third times the head) in proportion to the size of the birds. The greater yellowlegs (*Totanus melanoleucus*) (pl. 3, *B*) is 12 to 15 inches long, and the lesser yellowlegs (*T. flavipes*) 9 to 11 inches. Neither bird breeds on the Atlantic coast, but both may be seen there in migration. The greater yellowlegs winters from South Carolina southward, and the lesser yellowlegs entirely south of the United States. They are easily alarmed and take to wing uttering repeated loud, ringing, whistling cries, a habit that in old hunting days gave them the name "tattlers."

The dowitcher (*Limnodromus griseus*) is a plump-bodied bird, with the bill more than twice as long as the head. In spring the underside of the body is largely cinnamon, and in winter gray; the rump is largely white; and the tail is barred black and white. The dowitcher is far less excitable than the yellowlegs and may sometimes be closely approached. Dowitchers remain by preference in compact flocks and probe the mud industriously with their long bills.

The pectoral sandpiper (*Pisobia melanotos*) (fig. 8), or grassbird, 8 to 9½ inches in length, is a particular habitue of areas of short grass, soppy with water. The bill is a little longer than the head, the top of head streaked brownish black and light chestnut, the back feathers brownish black edged paler, the upper breast pale

brownish streaked with dusky, and the belly and rump white; the middle tail feathers are darker than the others. A note, *kriek, kriek*, given by the bird when flushed, has suggested one of its local names, "creaker." It is seen on the Atlantic coast only in migration.

The least sandpiper, or mud peep (*P. minutilla*), 5 to 6¾ inches in length, frequents muddy beaches everywhere and is often seen in salt marshes, sometimes assembled in large flocks. From the large numbers and small size of the sandpipers associating in these flocks, they are locally called "bumblebee peeps." There are several small sandpipers of very similar appearance, but it is impracticable to differentiate them here, though a common one on mud, with greenish-yellow legs and a slightly down-curved bill, is likely to be the least sandpiper. It does not breed in Atlantic Coast States but occurs in all of them in migration and winters from North Carolina southward.

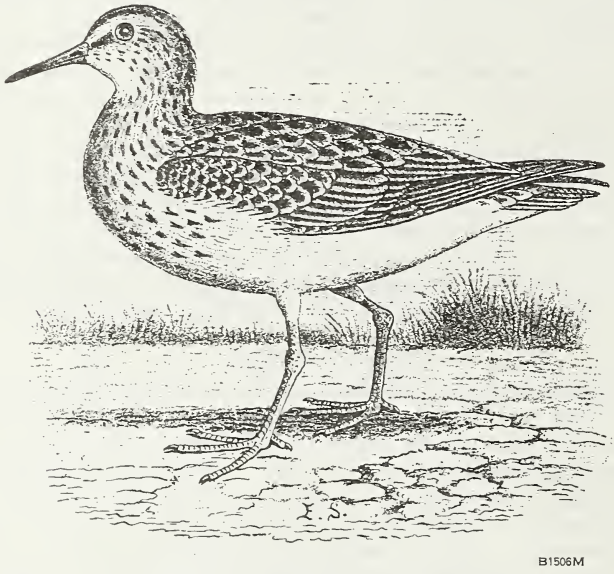


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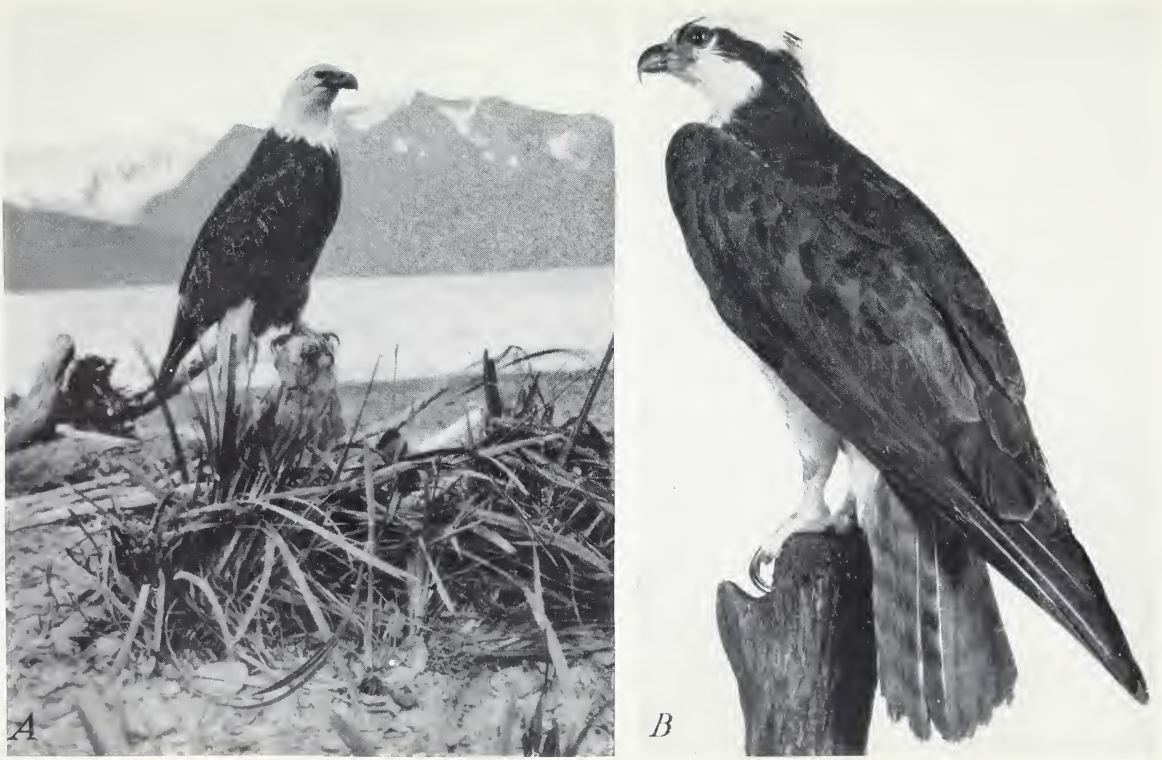
FIGURE 8.—Pectoral sandpiper.

The spotted sandpiper (*Actitis macularia*), although chiefly a fresh-water associate, is so universally distributed that individuals at times are likely to visit salt marshes. This bird, 6½ to 8 inches long, is grayish brown above and white below, marked with round dark spots that distinguish it from any other shore bird. This sandpiper is constantly bobbing and is on that account widely called teeter-tail. It usually cries *peet-weet*, when taking flight, and with down-curved wings alternately flaps and sails, usually not far before alighting again. It frequents both wet grassy or muddy areas.

It was pointed out by the writer[4] in 1911 (p. 9) that shore birds deserve protection by their beneficial feeding habits. Where local

[4] MCATEE, W. L. OUR VANISHING SHOREBIRDS. U. S. Biol. Survey Cir. 79, 9 pp., illus. 1911.



B2998M; E2551M

A, Bald eagle; *B*, osprey.

conditions permit, the birds are highly insectivorous, feeding on grasshoppers; caterpillars, including such pests as cutworms, armyworm, and cottonworm; and beetles, including billbugs and wireworms. Adults and larvae of both horseflies and mosquitoes are eaten; hundreds of mosquito wigglers have been found in single stomachs. Shore birds also consume water beetles and their larvae that prey upon small fishes, marine worms that devour oysters, ticks that carry cattle fever, and crawfishes that are destructive to crops and embankments. Shore birds not only thoroughly deserve protection but must have it to exist. They lay no more than three or four eggs, with one laying a year, so that probably only one or two young are reared. Most of them perform long migrations beset by hazards, and many migrate along narrow routes in which their whole populations are concentrated and where they would rapidly be killed off if exposed to attack by the army of hunters of today. Shore birds, with the exception of a few species, have been protected at all seasons ever since the passage of the Migratory Bird Treaty Act and, despite some poaching, have responded encouragingly to protection.

HAWKS AND EAGLES

The osprey or fish hawk (*Pandion haliaetus*) (pl. 5, B), breeds all along the coast and winters from the Middle Atlantic States southward. The nests are bulky and frequently placed on tall stubs, though a variety of other sites are sometimes occupied. The eggs, usually three, are from white to reddish brown, heavily spotted with deep brown. The fish hawk is a rather large bird (length, 21 to 25 inches; spread, 54 to 72 inches), dark above, pale below, with a good deal of white about the head. The tail and wing are chiefly barred, dusky, and white. The wings are long and distinctly elbowed in flight. The bird hovers over the water and plunges in after its prey, which consists almost entirely of fishes, though as a rule those obtained are chiefly noncommercial varieties. Without regard to that fact, it has long been looked upon with favor by fishermen, a fortunate circumstance. The osprey is specialized to get its food from the water, and it will not come to the ground even for prey it has accidentally dropped. There seems little likelihood, therefore, of its preying upon poultry, rabbits, or other landlubbers.

The bald eagle (*Haliaeetus leucocephalus*) (pl. 5, *A*) lives almost throughout North America and probably breeds near if not in salt marshes, for it is largely a coastal bird. It is larger than the osprey, being 30 to 34 inches long with a spread of 72 to 85 inches. The adults are dark brown, with the entire head, neck, and tail white. The long broad wings are flapped rather slowly and are much used also in soaring. The young lack the white head and tail and are chiefly dark, though some present a blotched appearance. Their size and similarity to the adults in action and habits, however, will identify them. The nest usually is larger and placed in a higher tree than that of the osprey. The eggs, usually two, are yellowish white. While an expert in flight and powerful enough to capture almost any of the forms of wildlife on the coast, the bald eagle is by preference a scavenger. Dead fishes and other animals it finds on beaches and mud flats are its most common food, though crippled wild fowl are soon found and despatched and a certain proportion

of living prey is taken. The eagle has long been reputed to harass the osprey until it drops its catch, which the eagle then recovers and devours, but according to the writer's experience, this must be an uncommon performance. The bald eagle does little harm to healthy wildlife, is a magnificent bird, a master of the air, and the embodiment of wild freedom. It should be preserved for its own sake, and because it is the national emblem.

VULTURES

Vultures, or buzzards, as they are commonly called in this country (the European buzzard is a large hawk), have no particular connection with salt marshes but are great fliers that may frequently pass over the marshes. They are large, chiefly black, birds, with the skin of the head and neck bare like that of a turkey, for which one of our species is named. The turkey buzzard, or turkey vulture (*Cathartes aura*), with the head and neck red is common north to New Jersey, but only a straggler beyond, while the black vulture (*Coragyps atratus*), with those parts black, is common north to Maryland. Both inhabit the Southern States. Vultures are seen in the air a great deal on windy days or on days when strong sunshine creates rising columns of air, the turkey vulture being especially adept at soaring. Both species feed chiefly on carrion and are likely to be attracted by dead fishes along the shore.

CROWS

Crows need no description. Two kinds visit the Atlantic coast salt marshes, but they are not readily distinguished by the inexperienced. The upland crow (*Corvus brachyrhynchos*), of almost continental range, averages somewhat larger than the coastal fish crow, however, and appears of sturdier build, particularly as to the chest, head, and beak. It is more accustomed to long flights and as a rule goes directly on its way with steady sweeping wing beats. Its *caw* is hoarser and guttural. The fish crow (*C. ossifragus*) has a more vacillating flight and a higher pitched and nasal *car*. The fish crow resides along the coast and the estuaries of larger streams, while the upland crow usually is only a visitor there. The fish crow occurs regularly from the southern coasts as far north as Connecticut, but is only a straggler beyond that State.

Crows eat almost anything, and the upland species sometimes becomes injurious to crops. The fish crow has little contact with farms but shares with its inland relative a fondness for the eggs and young of other birds that from man's point of view sometimes seems too pronounced. In the salt marshes, undoubtedly a high percentage of the eggs eaten by crows are those of the clapper rail, or marsh hen, and it has never even been suggested that the numbers of that bird are thereby reduced. Under some conditions, as after the flooding of nests of clapper rails and other birds in salt marshes by exceptionally high tides, eggs are washed out in windrows, and then their consumption by crows has no unfavorable significance. The writer has heard crows condemned on account of the number of eggshells found under their nesting trees, when it was perfectly evident that most of these were from drowned-out nests of the clapper rail. This is said in extenuation of the food

habits of crows because of the prevalence of immoderate condemnation. The lesson is to observe carefully and to find out all possible about crow-egg relationships, or for that matter about any wildlife problem, before taking any action. Then there should be done what seems necessary, but no more.

KINGFISHER

The belted kingfisher (*Megaceryle alcyon*) (fig. 9) frequents salt marshes where there are bare limbs, stakes, or other exposed perches. This slaty-blue bird (11 to 14¾ inches long) has a ring around the neck and the underparts chiefly white, and a well-defined erectile crest. The bill is stout and longer than the head. The female is marked by a cinnamon band across the breast below the slaty-blue one possessed by both sexes. The bird frequently utters a loud, harsh rattle. It breeds in holes in banks from southeastern Canada to South America and winters along the coast from Massachusetts southward. It captures fishes by plunging for them, and its fishing in salt marshes probably does little harm. The bird must, however, be controlled about fish hatcheries and rearing ponds. This is usually done by shooting or trapping, but screening all fishponds of moderate size would be preferable.[5]

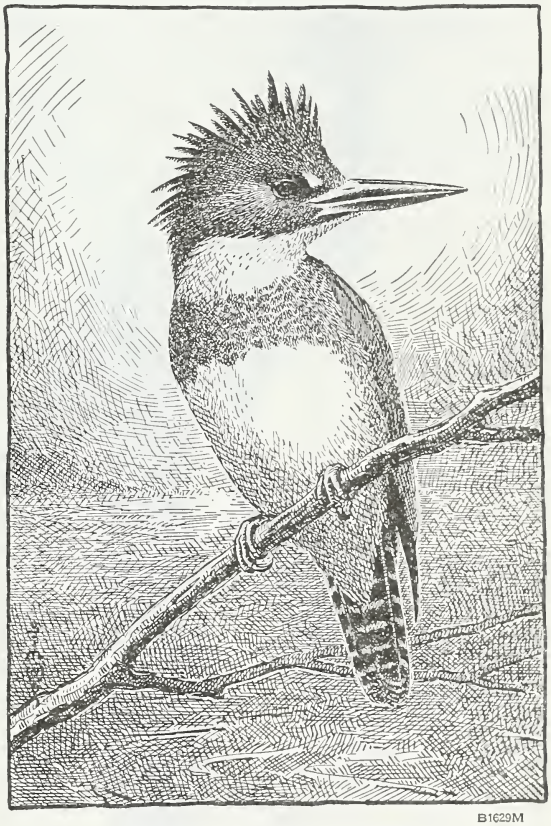


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FIGURE 9.—Belted kingfisher.

GRACKLES

The boat-tailed grackle (*Cassidix mexicanus*) (fig. 10), almost universally called jackdaw, is a bird of the coast from southern Delaware southward. The male is mostly black, with bluish and greenish reflections, while the female is chiefly buffy brown, with wings and tail darker. The male measures 15 to 17 inches, of which more than

[5] See footnote 3, p. 12.

a third is tail; the female is smaller, 12 to 14 inches. The tail is trough-shaped, a character particularly well displayed in flight. These birds feed a great deal about salt marshes, are not afraid of the water in which they wade, and submerge their heads in search of shrimps, small crabs, and snails. They eat crawfishes and insects also and occasionally damage grainfields near the coast. Jackdaws are quite noisy, making a variety of harsh, guttural calls. The purple grackle (*Quiscalus quiscula*), an inland species, somewhat smaller, with the sexes more nearly alike in dark and metallic coloration, may sometimes visit the marshes and be seen in company with the boattails.

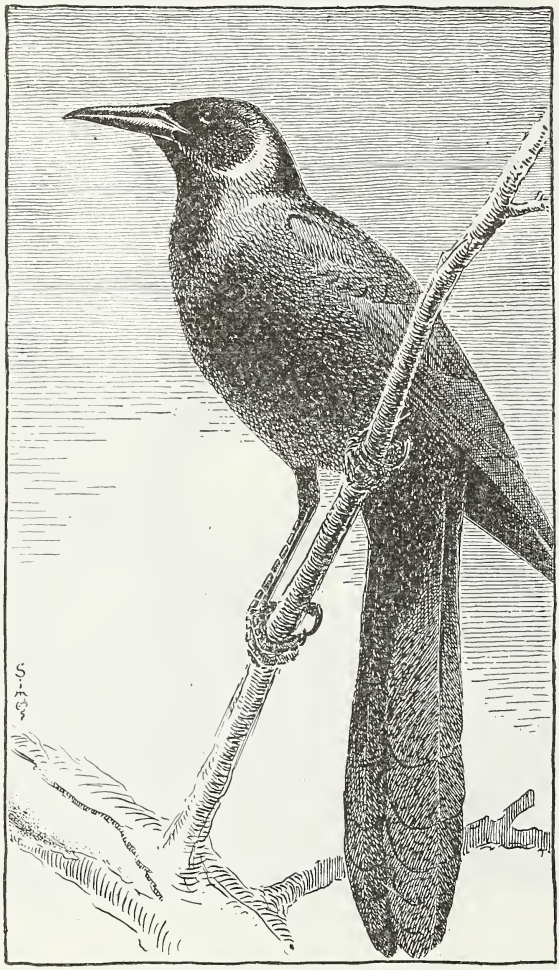

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FIGURE 10.—Boat-tailed grackle.

CORMORANTS, PELICANS, AND IBISES

Several water birds frequenting the South Atlantic coast may be briefly mentioned, as they may occasionally be seen in salt marshes. The double-crested cormorant (*Phalacrocorax auritus*) "shag," or "nigger goose," is a glossy, greenish-black bird, somewhat smaller than the Canada goose, and rather heavy in flight. The birds spend much time perched, for purposes of drying and preening, and when quiet suggest so many large black bottles. They are expert fishers and can catch almost anything they want. In some places they are destructive but on the whole consume more of the less valuable fishes than game and commercial species. The double-crested cormorant winters from Virginia (sometimes from New Jersey) southward, but a related race is resident all the year in Florida.

Almost everyone has read about pelicans, or seen pictures of them, so that recognition of the birds in life will not be difficult. The brown pelican (*Pelecanus occidentalis*) winters on the Florida coast

and may be seen in summer as far north as South Carolina. These birds characteristically fly in files, alternately flapping and gliding. When fishing, the birds plunge—almost, it would seem, awkwardly fall—into the water when a fish is spied near the surface. Brown pelicans subsist very largly on menhaden, thread herring, and other fishes not used for human food. Of the food fishes they probably take more mullets than any other kind.

The white ibis (*Guara alba*) (24 to 27 inches long), an almost entirely white bird, but with black wing tips, and a long, down-curved, reddish bill, breeds from South Carolina, and winters from Florida, south. It is usually seen in flocks and because of the curved bill is often called curlew, a term preceded by such modifiers as white or Spanish. The wood ibis (*Mycteria americana*), a much larger bird (35 to 37 inches long), may be seen both winter and summer from South Carolina southward. This bird also is mostly white, but the flight feathers and tail are dark, and the head and upper neck are unfeathered and scaly. The ibises differ from herons in flying with the neck as well as the legs stretched out.

WARBLERS AND SWALLOWS

Two small land birds are likely to be common enough in winter near or in southern salt marshes to attract attention. One, the myrtle warbler (*Dendroica coronata*), a little less than 6 inches long, is chiefly bluish gray above and white below, streaked with black, and with the crown, the rump, and a spot on each side of the breast, yellow. These attractive little birds winter regularly from New Jersey (casually from New England) south and sometimes swarm near the coast from the Carolinas southward. They frequently utter a characteristic and rather loud *tchip*. The myrtle warbler feeds to a considerable extent on the fruits of the bayberry or waxmyrtle, a habit alluded to in the standard vernacular name. This is an unusual habit for warblers, a highly insectivorous group of birds, but it enables the myrtle warbler to winter farther north than any of its relatives.

A remark to the same purport is in order relative to the tree swallow (*Iridoprocne bicolor*), and the berry-eating habit seems even more remarkable in its case. The tree swallow is glossy bluish-green above and white below; like others of its tribe it goes much in companies and is expert in flight. It is seen in winter regularly as far north as North Carolina and occasionally to New Jersey.

Both the warbler and the swallow consume insects whenever they are available and feed chiefly on them during the warmer months, as do all their kin. Birds of these families are legally protected throughout the Union.

OTHER WILDLIFE

Birds are a more prominent element of the wildlife of marshes than are some other groups, no doubt because of the ease with which they come and go—they do not have to stay but are free to visit. Temporarily frequenting a salt marsh is something very different from living there permanently. To reside there requires close adaptation; and, as we have seen, relatively few birds are fitted for

exclusive residence in salt marshes. The same is true among other kinds of wildlife, and one important group, the amphibians (toads, frogs, salamanders, and the like), are totally banned because their tender skins will not endure salt.

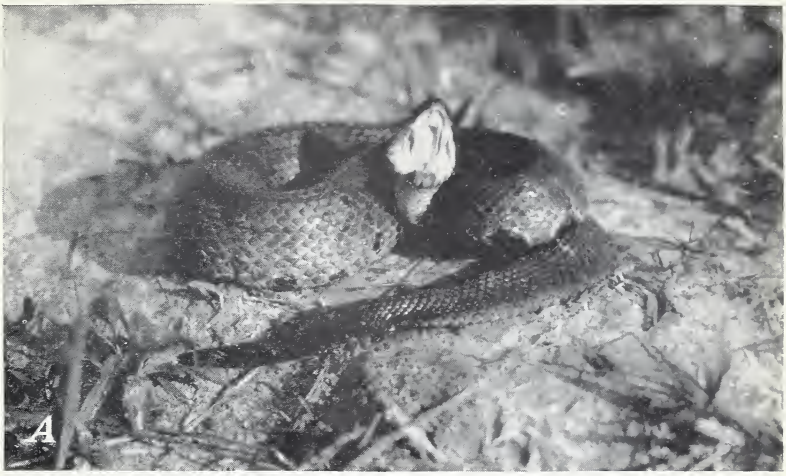
REPTILES

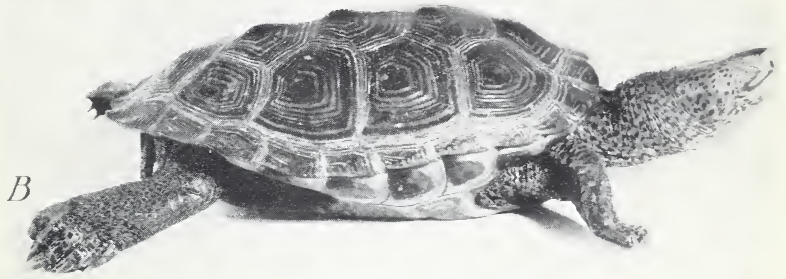
Comparatively few reptiles penetrate the salt marshes, though of course a number may be found near the landward edge (this is true of the amphibians, too), where conditions may become radically different in a short distance.

The alligator (*Alligator mississippiensis*), which all will recognize on sight, occasionally sojourns in salt water and at times, therefore, may be seen in the marshes. The normal range of the alligator is from North Carolina southward, but a few, possibly escaped from captivity, have been found as far north as New Jersey. Alligators deposit their eggs in layers in mounds of muck and vegetation scraped together by the female. Owing to the heat produced by the rotting of the vegetation, these serve as incubators. The animals usually have individual deep holes or dens under water. They feed on crabs, crawfishes, water insects, fishes, turtles, and sometimes larger creatures. There are old records of alligators 20 feet or more long, but at the present time a 12-foot animal is a very large one, and 15 feet is about the limit of verified size. Their numbers have been greatly reduced by hunting for the hides, which are used extensively by the leather industry in making traveling bags and in ornamental leather work.

The diamondback terrapin (*Malaclemys centrata*) (pl. 6, *B*) is a natural denizen of salt marshes from New Jersey southward. Its not very fitting name is suggested by the concentric ridging of the plates of the carapace, or upper shell. This turtle is plainly colored, greenish to black. It is the favorite catch for turtle stew and has been so hunted for the market that it is rare in most localities. Some success has been attained in raising diamondbacks in captivity.

The cottonmouth moccasin (*Agkistrodon piscivorus*) (pl. 6, *A*), a dangerously poisonous snake, is semiaquatic and a good swimmer, apparently unafraid of salt water, and may be found along the coast from North Carolina south. Its general color is dark chestnut-brown with some darker barring and with the throat and some slight stripes about the head yellowish white. The common name of this snake refers to the white lining of the mouth, which it is said the snake displays briefly before biting. The cottonmouth has a triangular form of head distinctly wider than the neck, which is characteristic of most poisonous snakes of the United States. This is a useful mark for separating it from large, dusky individuals of the common water snake, which may look surprisingly like a dully colored cottonmouth moccasin. Cottonmouths may attain a length of 4 feet and are of stocky build. They are not aggressive, and most cases of snake bite in which they are involved are due to the reptile being stepped on. Emergency treatment involves the placing of a tourniquet between the wound and the heart, loosening it for a minute or 2 every 10 or 15 minutes, cutting open the wound to secure good drainage, and removing as much of the venom as possible by suc-





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A, Cottonmouth moccasin; *B*, diamond-backed terrapin; *C*, muskrat.

tion. This should be done with a stout rubber bulb, not by the mouth, unless there is no other way, as the venom may be absorbed through abrasions in the lining of the mouth.[6]

FISHES

It is not in the province of this circular to treat of the fishes of salt marshes, but it should be mentioned that the waters of these marshes harbor large number of certain small fishes that are known to devour many mosquito larvae, or wigglers. They include the moderately stout killifishes of several kinds (*Fundulus* spp.), mostly greenish, marked with dusky and pale cross bands. They vary from 2 to 6 inches in length, when adult, and occur in one form or another along the whole coast line. The pursy minnow (*Cyprinodon variegatus*), also with faint cross bars, is higher bodied, more the shape of a sunfish. The male is bluish above, coppery below, and the female olivaceous. These minnows are 2 to 4 inches in length and are found from Cape Cod southward. Another mosquito-devouring group is the silversides (*Menidia notata*)—slender, translucent greenish fishes, with a silvery streak along each side. Their maximum length is about 5 inches, and they occur along the whole coast line.

Proper ditching of salt marshes to control mosquitoes has as one of its objects that of making every bit of water area of the marsh accessible to the small larva- or wiggler-eating fishes. The reason for keeping all pools and ditches smooth- or clean-edged is to leave no cover where the mosquito larvae can escape the fishes.

MAMMALS

No fur-bearing or other mammal inhabits salt marshes exclusively. Muskrats and meadow mice may live in the marshes at all seasons but in colonies that are only outliers of a very extensive inland range. Meadow mice, or field mice (*Microtus pennsylvanicus*), inhabit the marsh-hay zone, and sometimes may be quite numerous. They are short-tailed, smoothly rounded little rodents, not even the ears sticking out of the fur to any extent. Their average length is about 5½ inches for the body, plus 1½ inches for the tail. Their runways are narrow, irregular, and intersecting, some beneath, some on the surface of the ground. They are easily observable on burned-over areas or in spring after snow has melted away, from the flattened vegetation. Meadow mice feed largely on vegetable materials and in salt marshes can do no harm. They are the most frequently captured prey of a number of kinds of hawks and owls.

In form, muskrats (*Ondatra zibethica*) (pl. 6, *C*) are not unlike meadow mice, but they are about 2 feet long, of which nearly half is the bare, laterally compressed tail. The animals live in areas where bulrushes and cattails are abundant, feed upon all parts of these plants, and use them as materials for their winter lodges. These are low conical mounds, substantially built, and standing high enough above the water line to provide ample space within for a dry, grass-

[6] For information on poisonous snakes and treatment of their bites see the following: United States Biological Survey. Poisonous snakes of the United States. Wildlife Research and Management Leaflet BS–70, 19 pp. 1936. [Mimeographed.] Obtainable on request from the U. S. Bureau of Biological Survey, Washington, D. C.

lined living room. From it several passageways lead off in different directions under water. Muskrats are heavily trapped for fur, which ordinarily has a good valuation, considering their abundance. The revenue from the sale of skins on some controlled lands or muskrat farms has proved equal to or even greater than that of nearby agricultural lands.

Other mammals, occasional visitors to the marshes, include the otter (*Lutra canadensis*), the mink (*Mustela vison*), the raccoon (*Procyon lotor*), and the opossum (*Didelphys virginiana*), all probably well enough known for there to be no question as to identity.

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